Case report

Short term effect of mobilization with movement in patient with knee osteoarthritis: a case study

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Abstract:

A single case study design was used to investigate the effects of mulligan mobilization along with physiotherapy treatment in knee osteoarthritis.

The study involved three phases in an ABA design. Patient was assessed at baseline (A) for Knee Injury & osteoarthritis Outcome Score (KOOS) Index, ROM, Manual muscle testing & Time up and go test, treatment was given for 4 weeks (B) and again outcomes were assessed at end of session (A). The technique resulted in reduction in pain, improvement in functional ability and knee muscle strength and also walking time was reduced in case of knee osteoarthritis.

Although single case study design limits generalization of the results, it does provide evidence of the beneficial response obtained by use of Mulligan Mobilization along with IFT, strengthening exercises and gait training in knee osteoarthritis patients.

Keywords: - Knee Osteoarthritis, Mulligan Mobilization,Exercise Protocol

Introduction

Osteoarthritis (OA) is the most prevalent of the chronic rheumatic diseases and is a leading cause of pain and disability in most countries worldwide.[1] The prevalence of OA increases with age and generally affects women more frequently than men. Most of the OA disability burden is attributable to the hips and knees. [2] The reported prevalence for knee OA was 1.18 and 2.8 per 1000 per year in men and women respectively.[3]

In India the crude prevalence of clinically diagnosed knee OA was higher in the urban (5.5%) than the rural community (3.3%).[4] OA is characterized by degradation of the articular cartilage, resulting in an alteration of its biomechanical properties.[5] This contributes to a focal loss of articular cartilage, loss of joint space, osteophyte formation, focal areas of synovitis, periarticular bone remodelling and subchondral cysts.[6]

Individuals with knee OA typically have knee pain, joint stiffness, deficits in proprioception, and decreased muscle strength (force-generating capacity). [7, 8] An evidence based approach to management should include patient education about OA and its management, including pain management, options to improve function, decrease disability, and prevent or retard progression of the disease. [9]

Mulligan's concept of mobilization with movement (MWM) is a contemporary form of joint mobilization[10], consisting of a therapist-applied pain-free accessory gliding force combined with active movement[11].A key component to Mulligan's Mobilization-With-Movement (MWM) is that pain should always be reduced and/or eliminated during

the application. Further gains in pain relief may be attained via the application of pain-free overpressure at the end of the available range during the MWM.[12]

The American College of Rheumatology (ACR) published guidelines in 2012 on the non-pharmacologic and pharmacologic management of osteoarthritis. They gave a conditional recommendation regarding the use of physical modalities, including electrophysiologic agents such as Transcutaneous Electrical Nerve Stimulation (TENS) and Interferential Current Therapy (IFC), in knee osteoarthritis and the use of acetaminophen/paracetamol, topical and oral NSAIDs, tramadol and intra-articular steroid injection.[13]

IFCs have been used clinically since the 1950s, and its main clinical indications include pain management, reduction of swelling, and muscle strengthening.[14, 15, 16,17,18,19] TENS and IFC are forms of electroanalgesia based on the gate control theory of pain perception by Melzack and Wall. The basic concept behind IFC is that skin impedanceis inversely proportional to the frequency of an applied current; therefore there is less skin resistance to a frequency of 2000Hz than to a frequency of 200Hz. [20,14]

Therapeutic exercise plays a major role in the management of OA of the knee, with established evidence on improving both pain and function. It has been recognized as the standard of care in the treatment of osteoarthritis and is a strongly recommended non-pharmacologic intervention with a high level of evidence. [21,22,23]

Both aerobic walking and quadriceps strengthening exercises have been shown to reduce pain and disability in subjects with knee osteoarthritis. Quadriceps strengthening, however, canbe achieved in a variety of ways and many trials use complex hospital based regimens and sophisticated machinery notreadily available to the majority of patients with osteoarthritis. [21,22,23] Changes related to OA are more frequently observed in the medial compartment than in the lateral compartment of the knee [24].Gait modification is a frequently used conservative strategy in the clinic that offers promise in managing knee OA. Teaching a patient with medial knee OA to modify their walking may be beneficial in reducing dynamic medial knee load, although it is presently unclear which gait modifications are most likely to be successful. [25,26]

Hence the objective of our study to find out the short term combine effect of mulligan mobilization along with exercise therapy in knee osteoarthritis

Method:

Research Design: A single case study design was used to achieve the objectives of this project. A-B-A design which was already described for single case study was used for the present study.

Subject: A 60yr old female at initial assessment presented with history of right knee pain, difficulty in extending knee joint, and also difficulty in walking.

Physical examination

-History of pain in right knee joint.

- Crepitus present
- Restricted range of motion.
- Decrease muscle strength
- On A-P View X-ray of knee joint, Grade 3 (Kellegren& Lawrence scale)

Subject was selected for the study on the basis of this clinical presentation which is usually recognized as Right knee osteoarthritis.

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Measurement Procedure/ Pre-treatment Assessment (A)

Functional Disability is measured by using Knee osteoarthritis outcome score(KOOS) index.[27]

Manual muscle testing of knee flexors&extensors is measured based on Manual Research Council grading scale. [28]

Knee range of motion is measured by universal Goniometer.(0-180 deg.)[29]

Walking time measured by Time Up and Go test.[30]

Procedure of Technique/ Intervention Phase (B)

Patient with knee osteoarthritis received 4 weeks treatment. In that posterior glide of mulligan mobilization along with exercise protocol was given.

Mulligan mobilization

Posterior glide wasgiven 10 repetitions with 3 sets for 4 weeks.[12,31]

Mulligan mobilization for posterior glide

Patient is in supine lying position with affected knee is in flexed position.Then grasp patient proximal part of tibia fibula and give posterior glide. Maintain this glide then ask patient do flexion-extension of knee.

Physiotherapy Protocol consisted of:-

- **Interferential Therapy** [32]

Given With frequency of 80Hz for 15 minutes, 8 sessions in 4 weeks.

Exercises included:-

- **Static Quadriceps**: [33]
- **Static Hamstrings-**[34]
- **Vastus medialis obliques strengthening –** [35]

  All exercises were repeated 10 times.
- After exercises **Gait training** givenon parallel bar in front of the mirror.[36]

Result:

(Table -1)

Sr. No.	Outcome Measure	Pre-treatment (A)	Post-treatment assessment (A)	Percentage Improvement
1.	KOOS Index	29.34%	47.34%	18%
2.	Knee-ROM Flexion Right			
		20-88	0-100	47.05
	Left	0-134	0-136	43.56

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	Extension Right	88-20	100-11	18.9
	Left	134-0	136-0	0
3.	MMT- Flexor Right	Grade III	Grade IV+	25
	Left	Grade III	Grade IV	25
	Extensor Right	Grade III	Grade III+	0
	Left	Grade III	Grade IV	25
4.	Time up and Go test (sec)	41:07	30:09	73.26

Functional Ability:

Functional ability (29.34%) increased sharply from assessment phase (A) to the score (47.34%) i.e. 18% was found relief in post treatment assessment (A).

Knee Range of Motion

Knee Flexion ROM increase from Pre -treatment assessment (A) i.e. (20-88) to the post-treatment assessment (A) i.e. (0-100) while for knee extension ROM from Pre -treatment assessment (A) (88-20) to the (100-0) on right side.

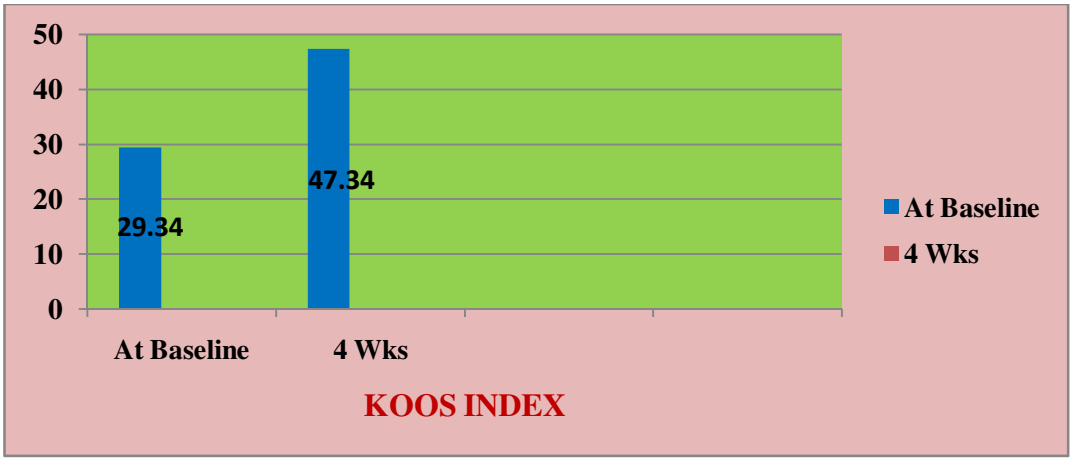
Knee Muscle Strength

knee muscle strength on right side from Pre -treatment assessment (A) (Grade III) to the post-treatment assessment (A) (Grade IV+) and on left side from Pre -treatment assessment (A) (Grade III) to the (Grade IV) in post-treatment assessment (A) while for knee extensors on right side from Pre-treatment assessment (A) (Grade III) to the post-treatment assessment (Grade III+) & on left side from Pre -treatment assessment (A) (Grade III) to the (Grade IV) in post-treatment assessment (A).

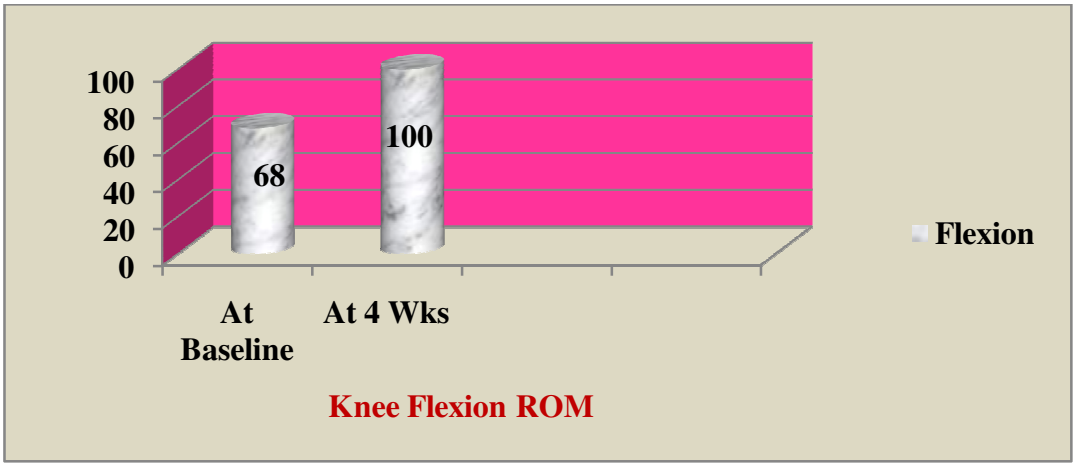
Time Up and Go Test:-

Walking time (41:07 sec) decreased sharply from pre- assessment phase (A) to the score (30:09 sec) i.e. 73.26% was found relief in post treatment assessment (A).

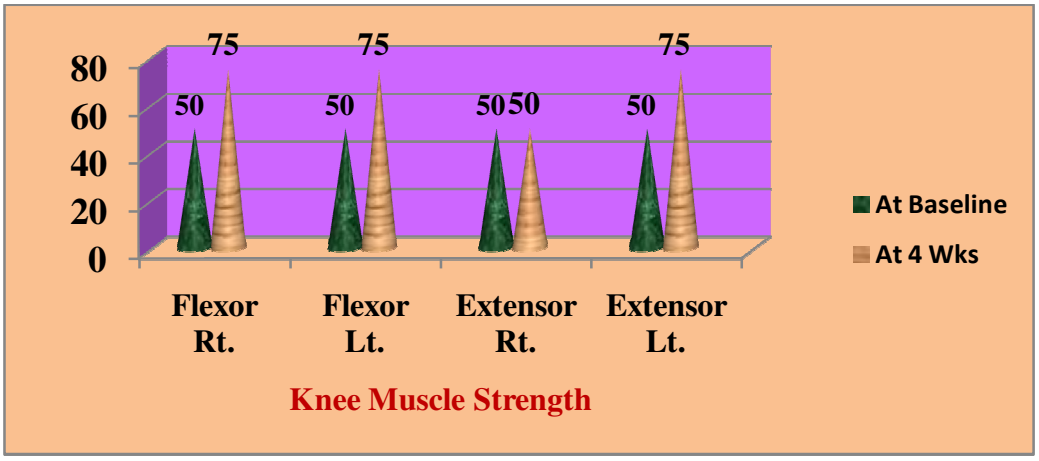
Graph 1 :



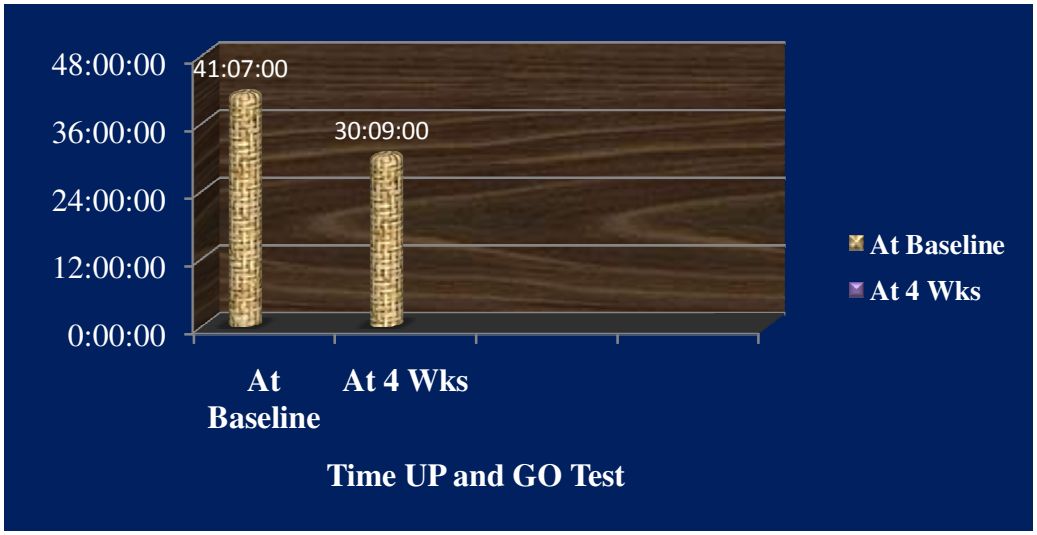
Graph 2:



Graph 3:



Graph 4:



Discussion:

This short term case report showed the beneficial effect of applying mulligan mobilization along with exercise protocol inpatients with knee osteoarthritis. The Improvements on baseline measures achieved during the treatment phases of 4 weeks.

In this study mulligan mobilization along with conventional physiotherapy showed significant treatment effect to reduce pain, improve functional activities of daily living and knee ROM. Resultsof present case study are similar to study done by Hiroshi Takasaki et al, in their case series they reported that with the treatment of mulligan mobilization in knee osteoarthritis there was reduction in pain, improvement in KOS-ADL and Knee ROM. [37]

Vicenzion et al and mulligan, proposed the mechanisms by which MWM achieves pain relief are not well understood, however biomechanical and neurophysiological mechanisms may be involved. Biomechanically it was initially proposed that MWM may address joint partner bone alignment (i.e., position fault) and some observations of positional faults have been made. Potential neurophysiological mechanisms include changes in descending pain inhibitory systems.[38, 39]

Use of Interferential therapy along with MWM reduced the pain in patients with knee osteoarthritis after 4 wks of treatment, this result is in line with previous study which was done by Buenavente et al. showed that the use of physical therapy agents in knee OA provided additional benefit in alleviating pain. In terms of physical function, IFC showed improvement of the WOMAC scores over a 4-week. It also recommended that the therapeutic regimen of IFC with beat frequency of 80-100Hz for 20 minutes for two to five times a week combine with exercise in managing pain and improving function in patients with knee osteoarthritis.[32]

Interferential current reduce the pain by pain gate mechanism, to selectively stimulate large diameter afferent fibers, the stimulus should ideally have pulse duration of 10 micro sec. And frequency of approx.100 Hz. A stimulus with these characteristics is able to selectively activate the large diameter afferent fibers & in this way utilizing the pain gating mechanism for pain relief.[40]

Our study showed that isometric and isokinetic knee exercises improves strength this result are similar to previous study which was done by Topp et al, who compared a dynamic resistance training program (exercises through the range of motion using an elastic band for resistance) with an isometric training program (exercises at specific joint angles without joint motion with the muscle contracting against a maximum-resistance elastic band), both groups demonstrated relief of knee pain (12%–14% improvement on the WOMAC pain subscale) and faster times with ascending and descending a flight of stairs and getting up and down from the floor (13%–23% improvement) after 16 weeks of training.[41]

According to Hafez et al; knee OA affects the hamstring muscle more than the quadriceps muscle. The ratio of the quadriceps to hamstring muscle strength is important for the stability of the knee and for protection from excessive stress. Therefore, strengthening the quadriceps muscle along with hamstring strengthening in management is more important. [42] Our study showed that isometric exercises improves strength this result are similar to previous study done by Da-Hon et al showed that strength training was more effective to improve knee extension strength and functional performance including going up and down stairs.[43]

Improvement in walking ability was assessed by time up and go test. Result are consistent with previous study which showed that functional activities combined with strengthening exercise with weight cuffs (squats and step-ups, knee extension/flexion, hip abduction/adduction) performed 3 times a week can elicit 43% reductions in pain with concurrent improvements in leg strength, stair climb time and repeated chair stand time.[44]

A Study done by Mu¨ndermann et al showed that the changes in loading pattern is a potential mechanism of gait compensation used by patients with knee OA to reduce the medio-lateral distance between the center of mass and the knee joint center, thereby reducing the moment arm of the ground reaction force and supposedly reducing the knee adduction moment at a later point in the stance phase.Though gait retraining has been shown to reduce the KAM and it shows promise as a non-surgical treatment for knee OA.[45]

Conclusion:

This study has documented that the Mulligan Mobilization along with exercise protocol leads to reduction in pain, cause functional improvement, also improve ROM and muscle strength in knee osteoarthritis.

Conflict of Interest: Nil

Funding: No

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